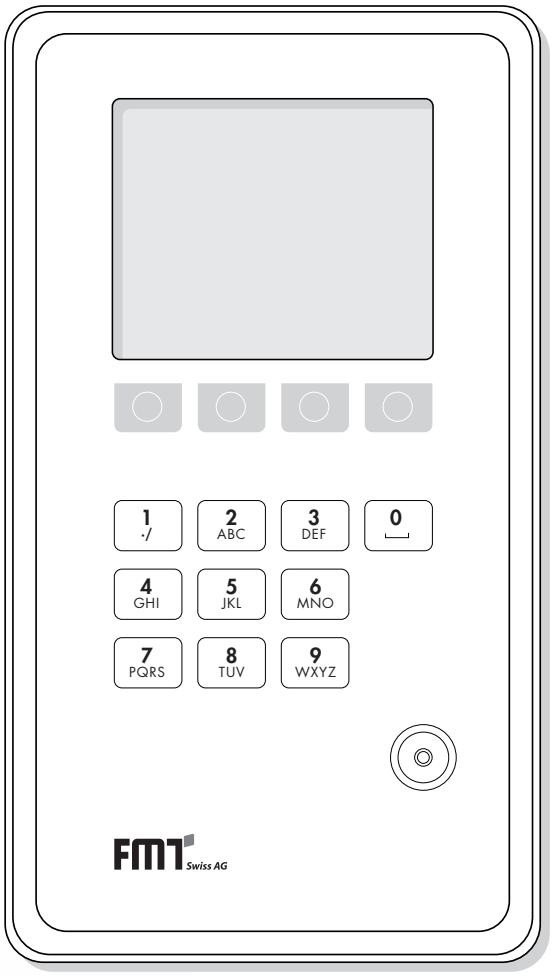
# Service Manual DMS

## DieselManagementSystem




FMT Swiss AG

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# 1. Document history

| Date | Name | Version | Change |
|---|---|---|---|
| 28/10/2008 | Ts | 1.00 | Initial draft |
| 17/11/2008 | Ts | 1.01 | Changes after new FW version |
| 09/12/2008 | Ts | 1.02 | Corrections |
| 07/12/2009 | HD | 1.03 | new configuration elements for heater limits<br>input of operating hours |
| 16/03/2010 | HD | 1.04 | small revision |

# 2. Configuration

The configuration will be updated every time the SD card is inserted to the control unit.

# 3. Identification

The identification of the user will be executed with a PIN, the iButton or both. Determine by setup. The PIN is a 4 digit number. The iButton ID is a 16 digit hexadecimal number and is marked on the bottom of the key.
Depending on the user type, the user has different rights of access. A "standard" user can fill his vehicle, the supervisor can set date and time and can calibrate the control unit. The service engineer can arrange hardware tests like a display test, verifying of the inputs and outputs and can update the system. The user type is will have be to configurated by the DMS PC application for every user.

# 4. Vehicle selection

The vehicle selection can be effected either by a list of all assigned vehicles or with the manual input of the vehicle license number. If the selection is completed with the manual input of the license number, it will not be compared to the user's vehicle assignment.

# 5. Mileage / diesel consumption control

If the mileage is configured, the user has to enter the current mileage ahead of any refuelling process. With this input, the PC application is able to calculate an average diesel-consumption (per km) for the vehicle.

# 6. Operating Hours / gasoline consumption control

If operating hours input is configured (alternatively or additionally to the mileage), the user has to enter the current reading of operating hours. With this input the PC application is able to calculate an average diesel-consumption (per operating hour) for the vehicle.

# 7. Refuelling

After removing the diesel control nozzle, the pump will start with a certain delay set up in the PC application. This will prevent an overpressure, until the nozzle is placed in the vehicle tank.

During the filling, the amount of diesel discharged is shown at the display.

- The pump stops automatically when meeting one of the following conditions:
- Tank level below minimum
- Leakage failure (Leakage detected or no communication to TankAlert sensor)
- The user is not identified
- Maximum amount for filling is reached (selectable on PC-Application)
- The flow control does not determine a definite diesel flow for the specified time.
- The nozzle is placed back.

When the refuelling is completed and the nozzle is placed back correctly, all data are stored on the SD.

# 8. Supervisor

## 8.1 Date

On this display the date can be set. Pushing the left and right arrow it is possible to switch between the day, the month and the year. To confirm the new date, press the RETURN button.

## 8.2 Time

On this display the time can be set. Pushing the left and right arrow it is possible to switch between hours, minutes and seconds. To confirm the new time, press the RETURN button.

## 8.3 Calibration

The selected refuelling tap connection can be calibrated on this display. Remove the diesel control nozzle and start filling a calibrated vessel. The amounts of flow rate counter pulses are shown on the display. After the vessel is filled, place back the control nozzle and enter the volume of the vessel. A pressing of the RETURN button will save the calibrated volume. If the control nozzle is not placed back correctly, and the RETURN button is pressed, the calibration will be aborted, also if no volume of the vessel is entered.

## 8.4 Calibration A

The selected pump can be calibrated in this display with entering the pulse amount and the volume of the vessel. To switch between the input fields, use the up/down cursor. Pressing RETURN will save the calibrated volume. Volumes of zero are not allowed, they will abort the calibration.

To copy a calibration from one control unit to another unit, copy the file "Calib.dat" from the SD-Card and place it on the SD-Card of the new control unit.

# 9. Service

## 9.1 FW Update

This option is available, if a new firmware file exists on the SD card, only.
To make a firmware update the firmware file "DMS.bin" must be placed in the DMSdata folder of the PC application. Start an "export" of the data to the SD card. The "DMS.bin" is copied to the SD card. Now insert the SD card and login as a "Service engineer" user at the control unit. The menu item firmware update is now available. Select the menu item by pressing the 1.
To update the control unit, the RETURN key must be pressed in the updated display.
The control unit makes a restart and loads the new firmware. After the restart, you should see the new version on the top right side.

## 9.2 Inputs

This display shows all inputs of the control unit and their status, independent wether they are connected or not. If the input shows two columns, the first one shows the raw data read from the analogue input or the serial port. The second column shows the converted value.
For the leakage of tank 1, the first value shows the input of the sensor connected to X13/9 (Digital Input), the second value is delivered from the TankAlert.
With the "up" or "down" button switch to the next / previous page.

## 9.3 Outputs

This display shows all outputs from the control unit and their status.
With the "up" or "down" key, it is possible to mark an output. This output can be set with the "1" key or can be reset with the "0" key.

## 9.4 Display Test

The display test will write the characters, fed in on the keyboard, to the display. It can be stopped by pressing RETURN.

# 10. SD-Card

The SD-Card is the storage place of all data for the control unit.
All refuelling process data and the filling level are written and stored there. The configuration, provided users and the text shown is read from it. So the SD-Card is designed to be used as the transport medium for the data between the control unit and the PC application.

## 10.1 Files on SD-Card

The following files are on the SD-Card.

| Name | Creator | Description |
|---|---|---|
| Text.txt | PC application | Language text file |
| Config.dat | PC application | Configuration file |
| User.dat | PC application | User file |
| DMS.bin | PC application | FW update file |
| Tank1.dat | PC application | File for Tank Level calculation |
| StationId.dat | PC application | Control unit / station ID file |
| Font.dat | PC application | Font file for control unit |
| Fuelling.dat | Control unit | File with filling process data |
| Tank.dat | Control unit | Fill level amount file |
| Calib.dat | Control unit | Calibration value file |

## 10.2 Data from PC application

With the export function on the PC application, all necessary files are copied from the PC application to the SD-Card. The control unit detects the new SD-Card and reads all new files and reconfigures the unit.

## 10.3 Data to PC application

With the import function on the PC application, all necessary file are copied from the SD-Card to the PC application. The file "Fuelling.dat" is deleted after it was read by the PC application.

# 11. Timeouts

| Name / Description | Timeout |
|---|---|
| Pin Input | 1 min |
| Vehicle selection | 1 min |
| I-Button connect after Pin Input | 1 min |
| Mileage input | 1 min |
| Display Tank name. Max. time to wait until control nozzle will have to be removed. | 1 min |
| Service acknowledgement time. Max. time until a service function is selected | 1 min |
| Supervisor acknowledgement time. Max time until a supervisor function is selected | 1 min |

# 12. Status LED / Error's

The Status LED is permanentely active, if the system runs trouble-free. In case of an error the LED will blink. Each error is shown with its own amount of blink states. After each error, there is a delay of 2 sec.

| Blinks | Description | Correction of the defects |
|---|---|---|
| 1 | SD Card missing | Insert SD card or remove and insert it again. |
| 2 | Configuration file error | The control unit cannot read the configuration file. Try to export data again from PC application. |
| 3 | Language text file error | The language text file cannot be read. Try to export data again from PC application. |
| 4 | User file error | The user tried to access to the control unit was unknown or the user file was missing. |
| 5 | Tank process file error | The process data file could not be written. SD not inserted or SD card is full. |
| 6 | Calibration error | The control unit is not calibrated. The supervisor must calibrate the system. |
| 7 | Font file error | The font file cannot not be read. Try to export data again from PC application. |
| 8 | Tank level table file error | The file with the level indication cannot not be read. Check if the level indication for the tank exists on the PC application and try to export data again from PC application. |
| 9 | Tank level file error | The file for the tank level cannot not be written. |
| | | |
| 13 | Tank 1 pressure / filter error | Check the filter. |
| 14 | Tank 1 minimum error | Check the tank level. Minimum is reached. |
| 15 | Tank 1 leakage error | The tank has a leakage. Suck out the liquid. |
| 16 | Tank 1 temperature error | The tank temperature exceeds the calibrated temperature. Check the reason for this error. |
| 17 | Tank 1 level sensor error | Check the cable to the level sensor (Alert Sensor). Check the mounting of the sensor. |
| 18 | Tank 1 Temperature cable failure | Check the cable to the tank temperature sensor |
| 19 | Tank 1 Pressure cable failure | Check the cable to the pressure sensor |
| | | |
| 21 | Tank 2 pressure / filter error | Check the filter. |
| 22 | Tank 2 minimum error | Check the tank level. Minimum is reached. |
| 23 | Tank 2 leakage error | The tank has a leakage. Suck out the liquid. |

# 13. Heater

The heater is optional. It is recommended, if the temperature can get very low. The display is specified for a temperature from -20°C to +70°C. If the temperature can get below this range, it is necessary to place the heater unit.
The heater is switched on if the temperature falls below a configurable limit [°C] (Switch on Limit). If the inside temperature of the tank reaches a second limit, caused by the heating, the heater switcheds off again automatically (Switch off Limit). Both limits should be set appr. 10°C apart from each other to avoid a too frequent on-off switch of the heater.
Possible pre-set data: Switch-on limit 0°C, switch-off limit +10°C
If the heater unit is activated, it is self-controlling.

# 14. Battery

The battery is placed to store the date / time on the control unit, if external power-supply is lost.
The battery is designed for a lifetime of 5 years.

# 15. Fuses

The control unit is secured by 3 fuses.

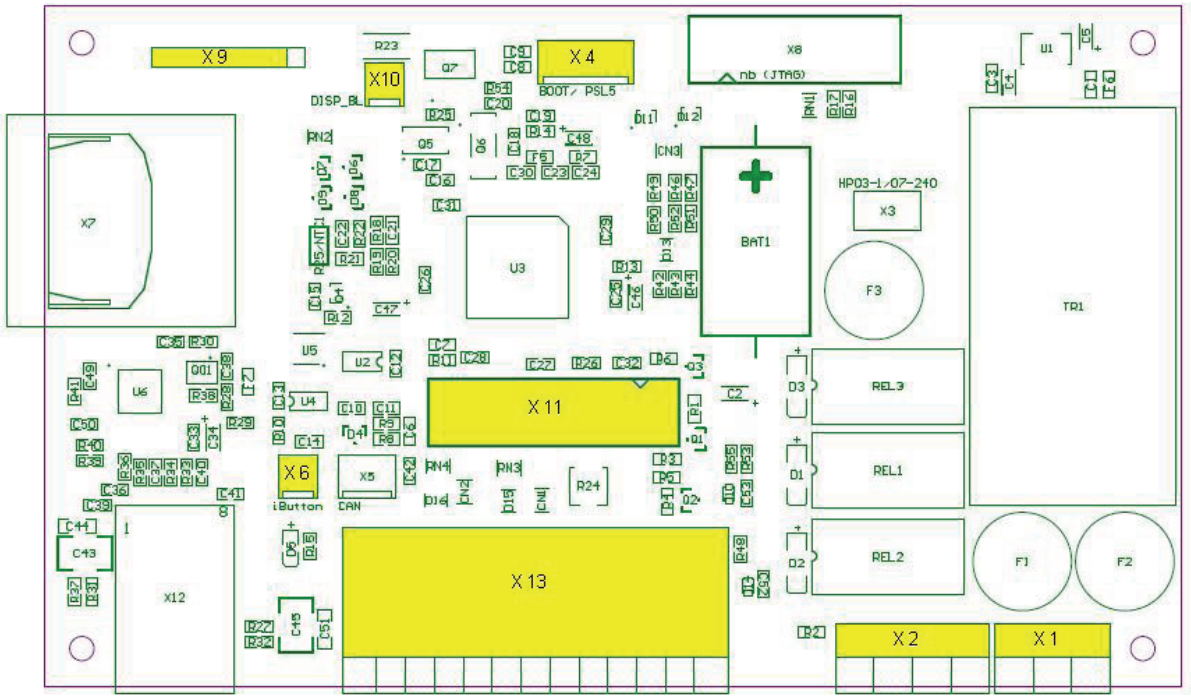
## 15.1 F1 / F2 Fuse power supply 230 V / 10 A

The fuses F1 and F2 secure the power supply and should be designed for 230 V~ and 10 A. With these fuses the pumps are protected.

## 15.2 F3 Fuse power supply control unit

The fuse F3 secures the power supply of the control unit and should be designed for 230 V~ and 1.5 A.

# 16. Connectors



## 16.1 Program download Connector, X4

| Pin | Description |
|---|---|
| 1 | 5 V output |
| 2 | TxD |
| 3 | RxD |
| 4 | Reset |
| 5 | Ground |

## 16.2 I-Button Connector, X6

| Pin | Description |
|---|---|
| 1 | Signal |
| 2 | Ground |

## 16.3 Display Connector, X11

To adjust the contrast of the display, use the R24 potentiometer placed between the display connector X11 and the IO connector X13.

| Pin | Description |
|---|---|
| 1 | FG |
| 2 | VSS |
| 3 | VCC |
| 4 | V adj |
| 5 | VEE |
| 6 | -WR |
| 7 | -RD |
| 8 | -CE |
| 9 | C/-D |
| 10 | -HALT |
| 11 | -RESET |
| 12 | D0 |
| 13 | D1 |
| 14 | D2 |
| 15 | D3 |
| 16 | D4 |
| 17 | D5 |
| 18 | D6 |
| 19 | D7 |
| 20 | NC |

## 16.4 Display Backlight Connector, X10

| Pin | Description |
|---|---|
| 1 | 5 V |
| 2 | GND |

## 16.5 Keyboard Connector, X9

| Pin | Description |
|---|---|
| 1 | Ret 0 |
| 2 | Ret 1 |
| 3 | Ret 2 |
| 4 | Ret 3 |
| 5 | Scan 0 |
| 6 | Scan 1 |
| 7 | Scan 2 |

| | |
|---|---|
| 8 | Scan 3 |

## 16.6 Power Connector, X1

| Pin | Description |
|---|---|
| 1 | N |
| 2 | PE |
| 3 | L |

## 16.7 Heater Connector 250 VAC, X3

| Pin | Description |
|---|---|
| 1 | L |
| 2 | N |

## 16.8 Pump Connector 250 VAC / 10 A, X2

| Pin | Description |
|---|---|
| 1 | L Pump 1 |
| 2 | N Pump 1 |
| 3 | L Pump 2 |
| 4 | N Pump 2 |

## 16.9 I/O Connector, X13

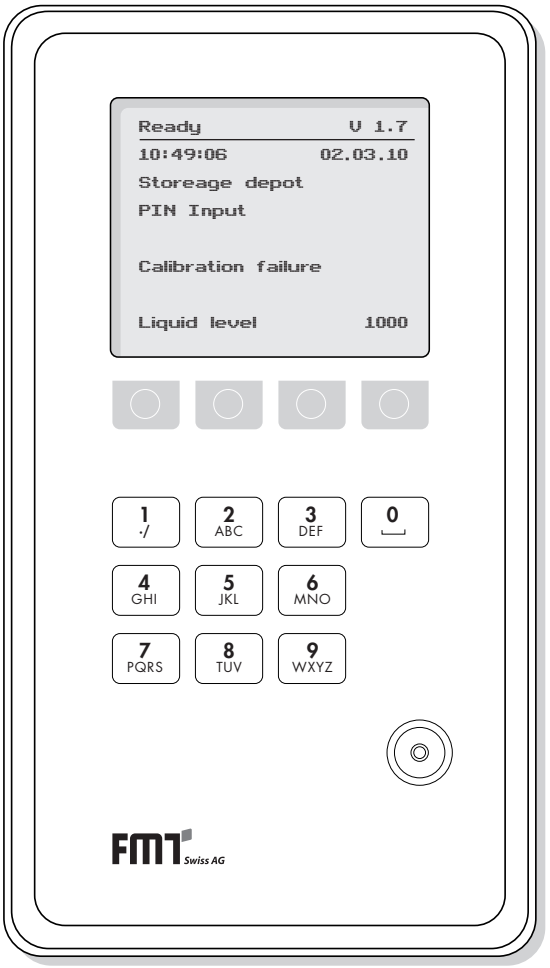
| Pin | Description | Contact |
|---|---|---|
| 1 | Tank 1 control nozzle (Digital Input) | Normal Close |
| 2 | Ground | |
| 3 | Tank 1 flow control (Digital Input) | Don't care, pulse |
| 4 | Ground | |
| 5 | Tank 1 pressure (Analog Input, 4 – 20 mA) | |
| 6 | Ground | |
| 7 | Tank 1 Tank temperature (Analog Input, 4 – 20 mA) | |
| 8 | Ground | |
| 9 | Tank 1 Leakage (Digital Input) | Normal Open |
| 10 | Ground | |
| 11 | Tank 1 Level sensor (Serial Input) | Blue |
| 12 | Ground | Black |
| 13 | 3,3 V / 5 V output supply | Red |

| Pin | Description |
|---|---|
| 14 | Tank 2 gas nozzle (Digital Input) | Normal Close |
| 15 | Ground |
| 16 | Tank 2 flow control (Digital Input) | Done care, pulse |
| 17 | Ground |
| 18 | Tank 2 pressure threshold (Digital Input) | Normal Open |
| 19 | Ground |
| 20 | Tank 2 Tank Minimum (Digital Input) | Normal Open |
| 21 | Ground |
| 22 | Tank 2 Leakage (Digital Input) | Normal Open |
| 23 | Ground |
| 24 | Reserve |
| 25 | Ground |
| 26 | Reserve |

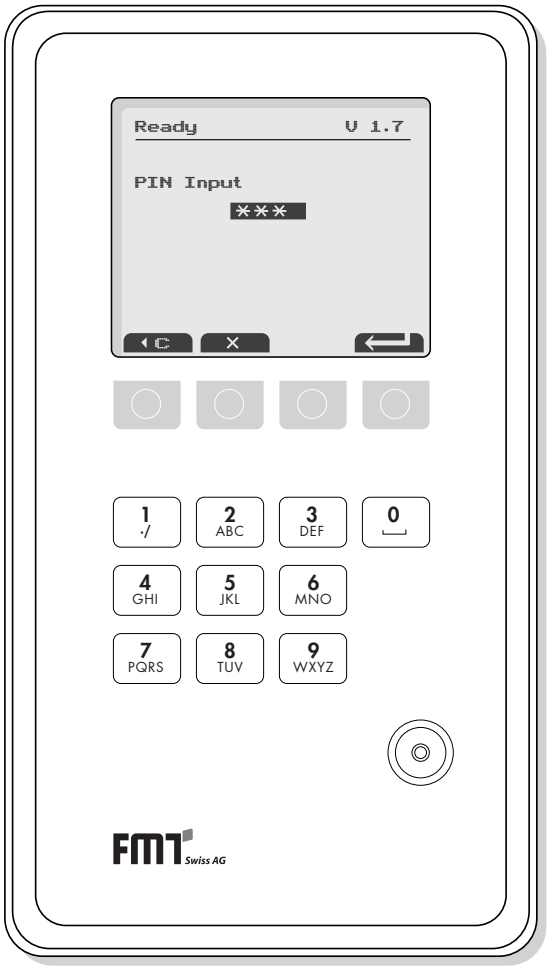
# 17. Supervisor Menu

Start of installation

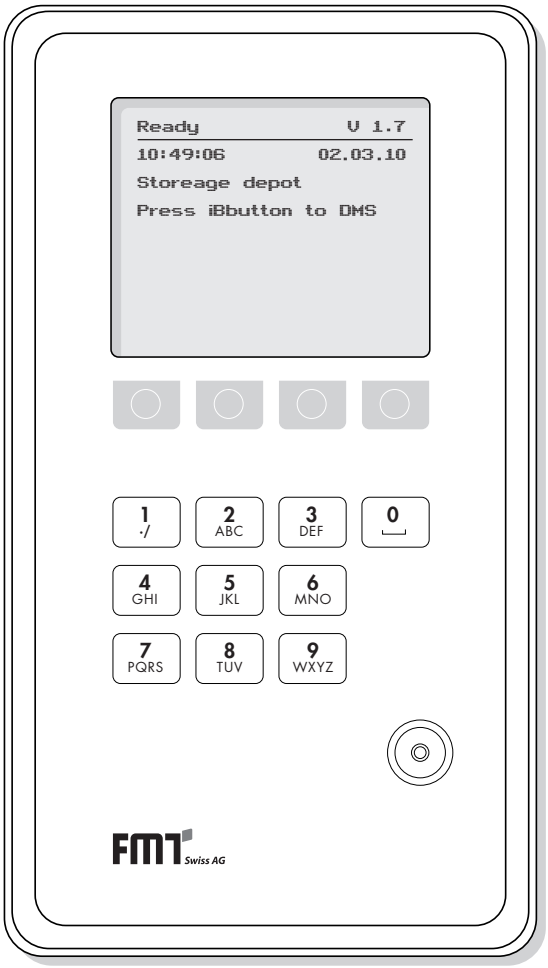
Insert SD-card into the DMS (PRESS any button for illumination.)



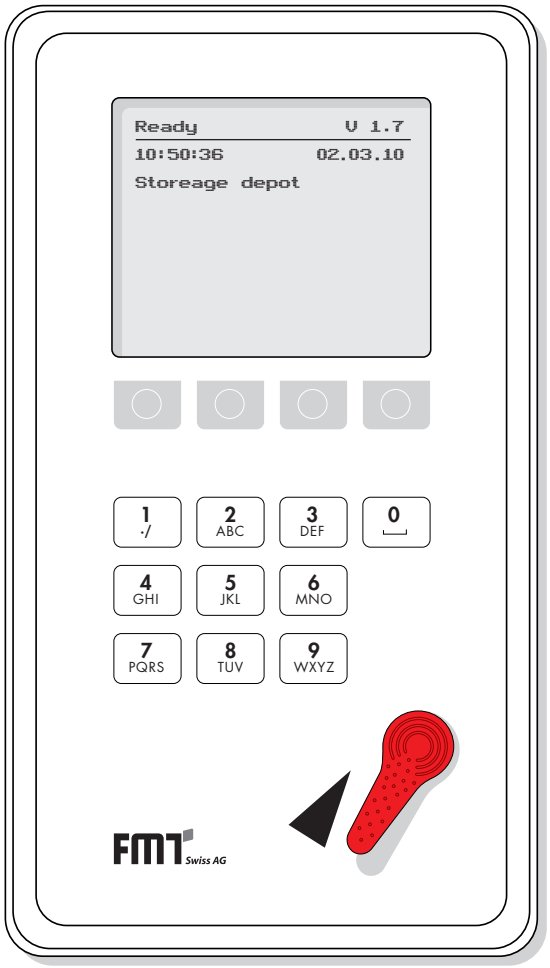

Request for PIN-input and calibration of the system (if not existing already)



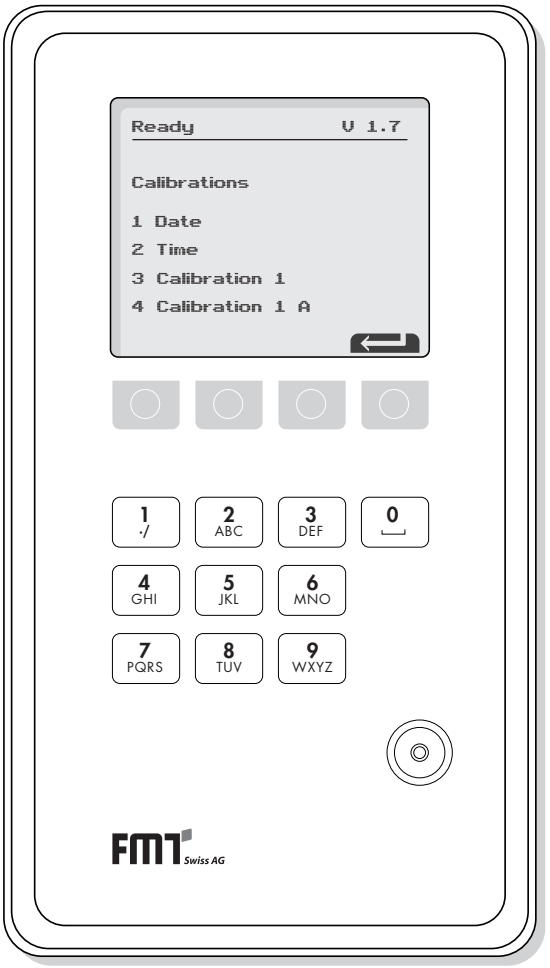

Enter 4-digits Supervisor PIN an press Return-button




Request for i-button connection

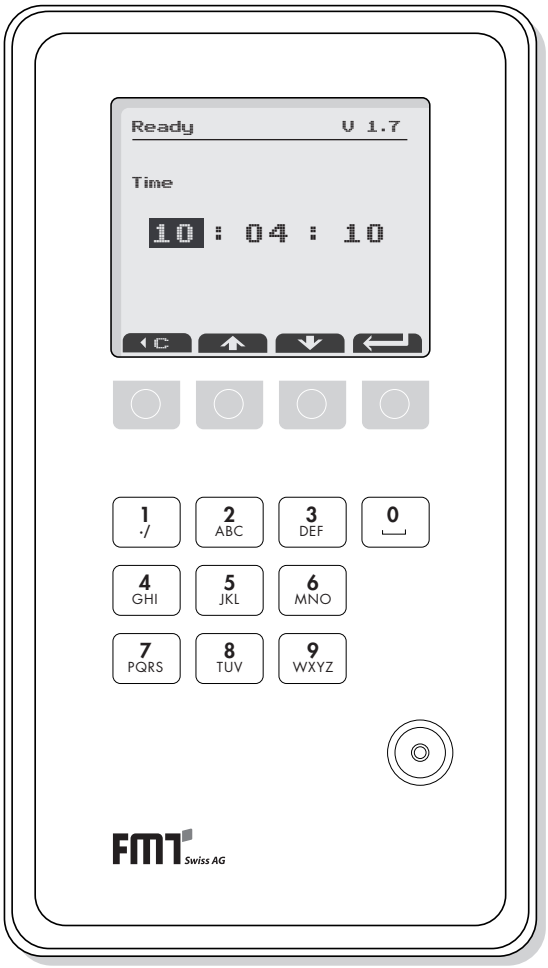



Connect red Supervisor i-button

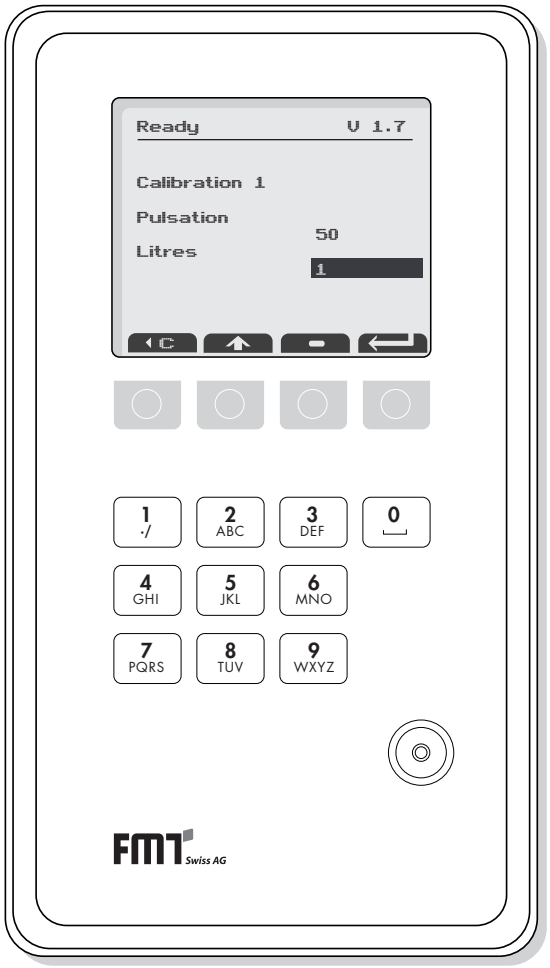



The display shows any configurations to be done. Press buttons 1-4.

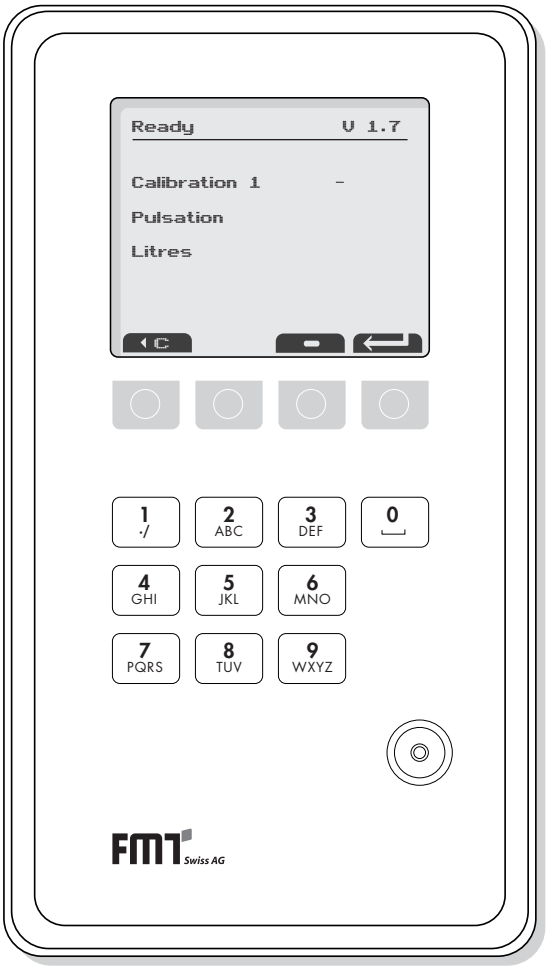
Enter date using the number keys. Confirm with the Return-button.



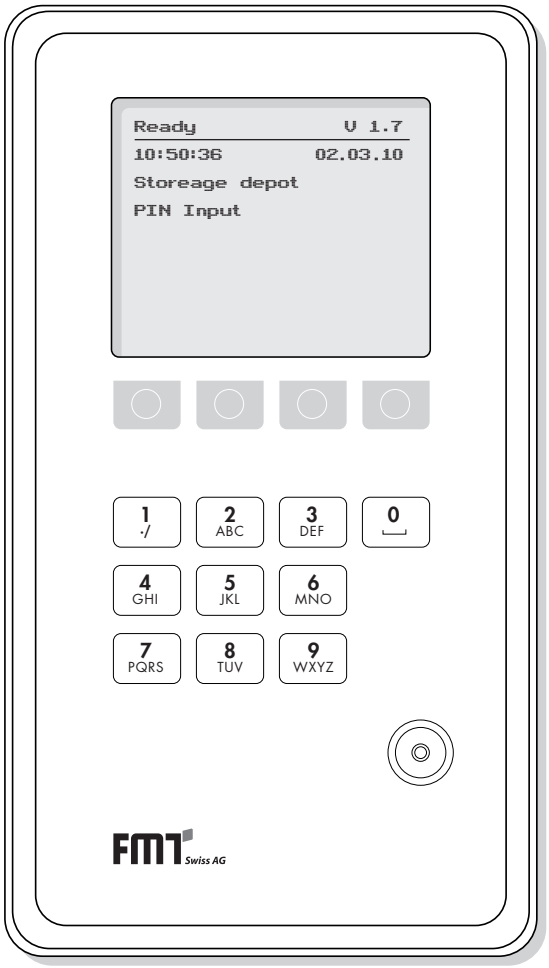

Enter time using the number keys. Confirm with the Return-button.




Calibration according to the demands



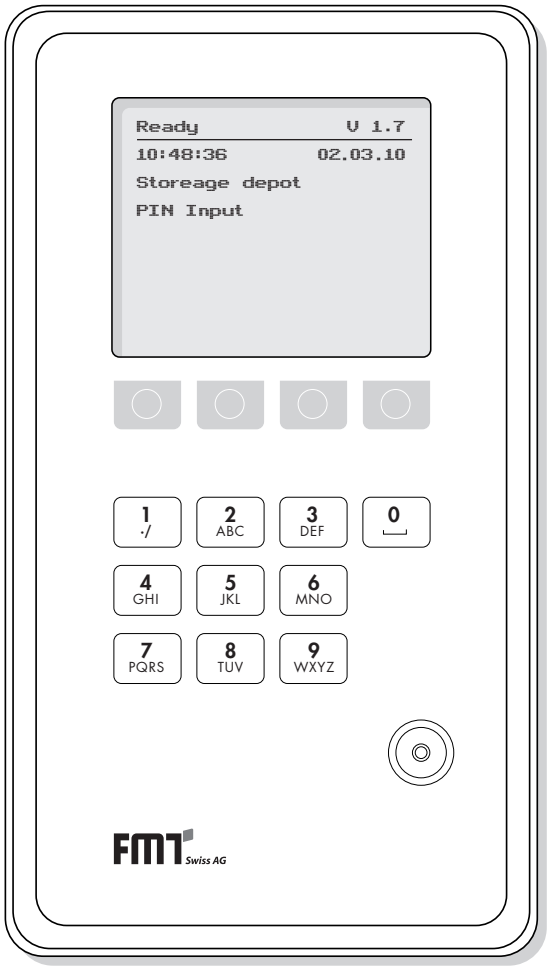

Confirm calibration ba a refilling process (see page 4, 8.4). Confirm with Return-button.



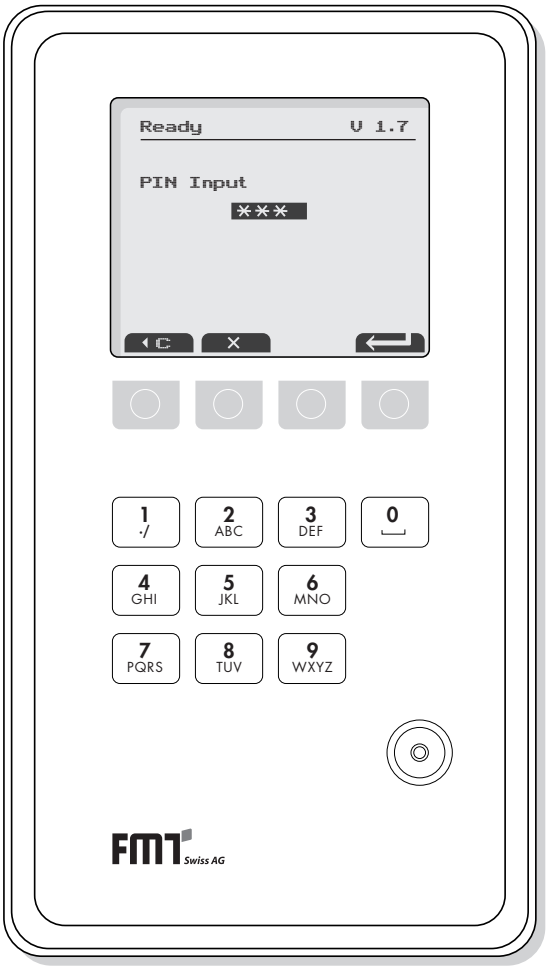

Back at start menu 1

# 18. Service Menu

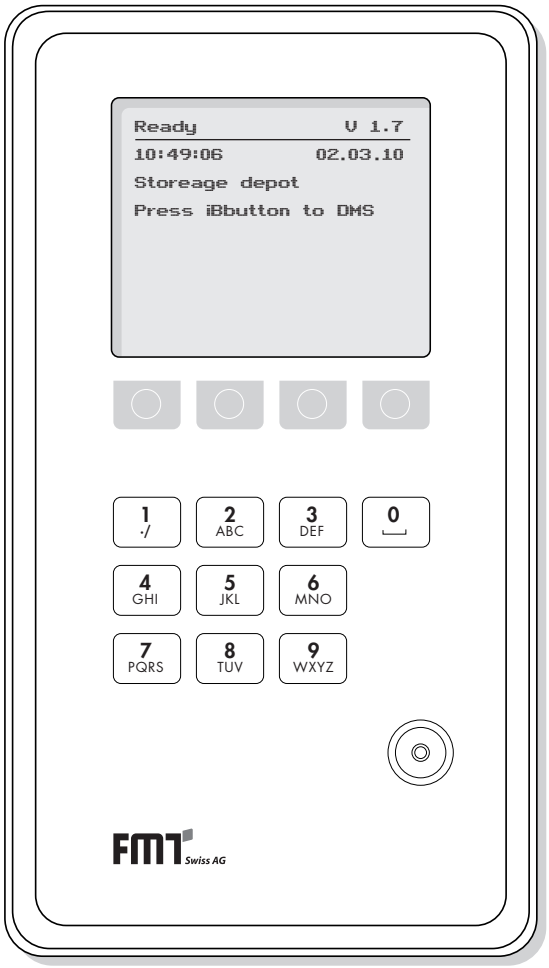
(Check-up of the system and of the emergency functions)



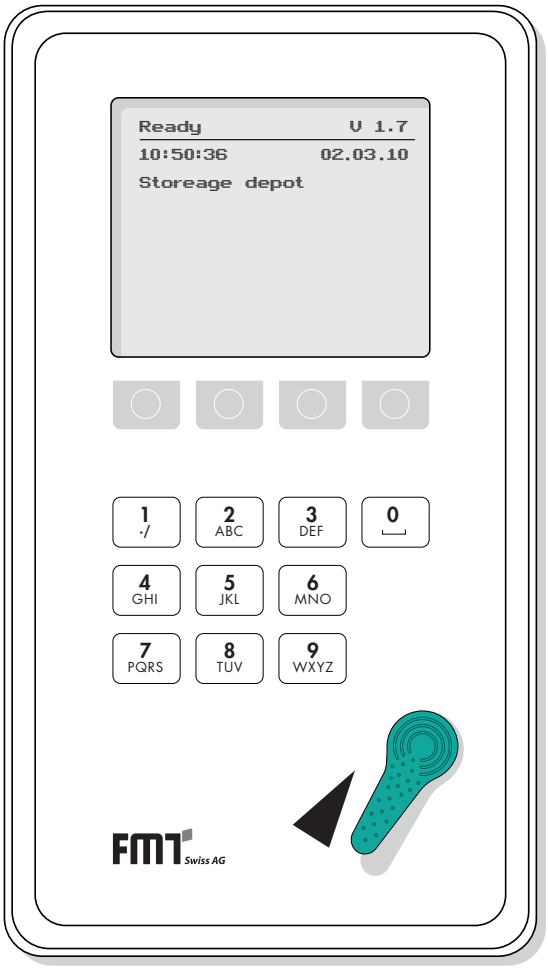

Request for PIN-input




Enter 4-digits Service PIN an press Return-button

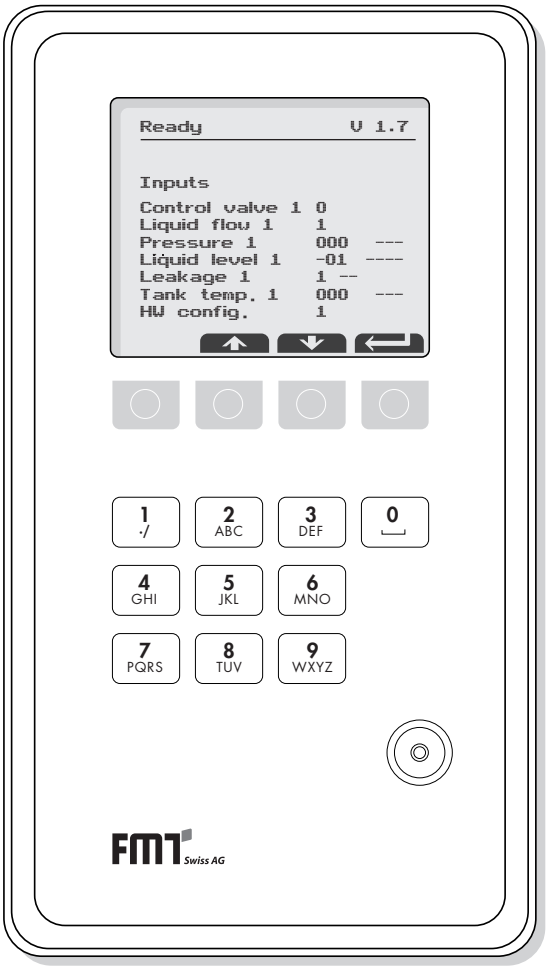



Request for i-button connection



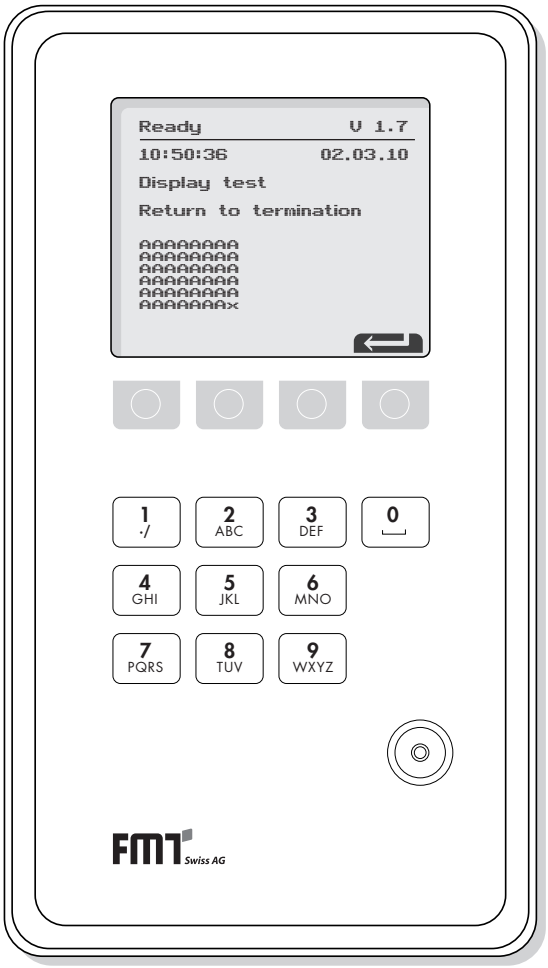

Connect green Service i-button

The display shows any configurations to be done. Press buttons 2-4.



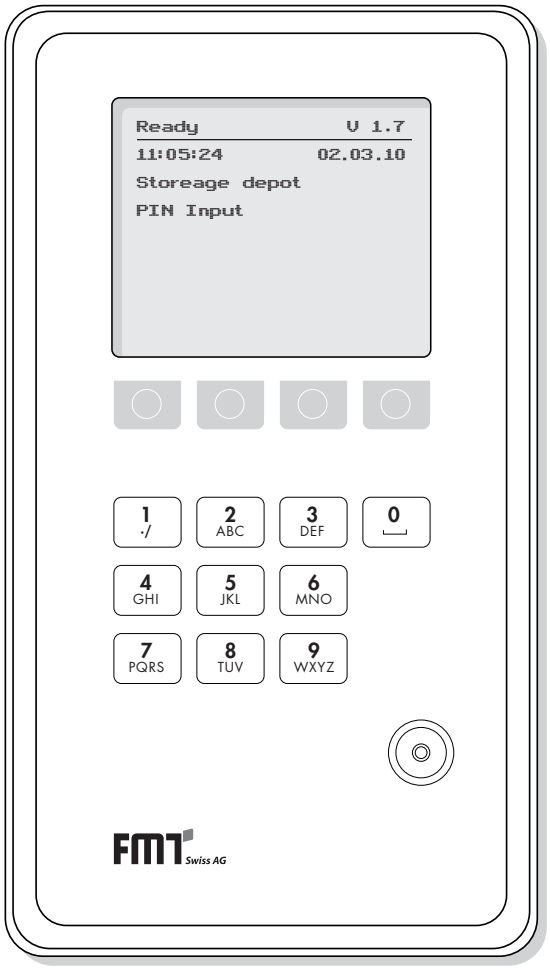

Check inputs.
Operating the different components 1 or 0 will appear.

Check outputs.
The selected component will go on line, i.e. the pump shall start operating, if you set 1.

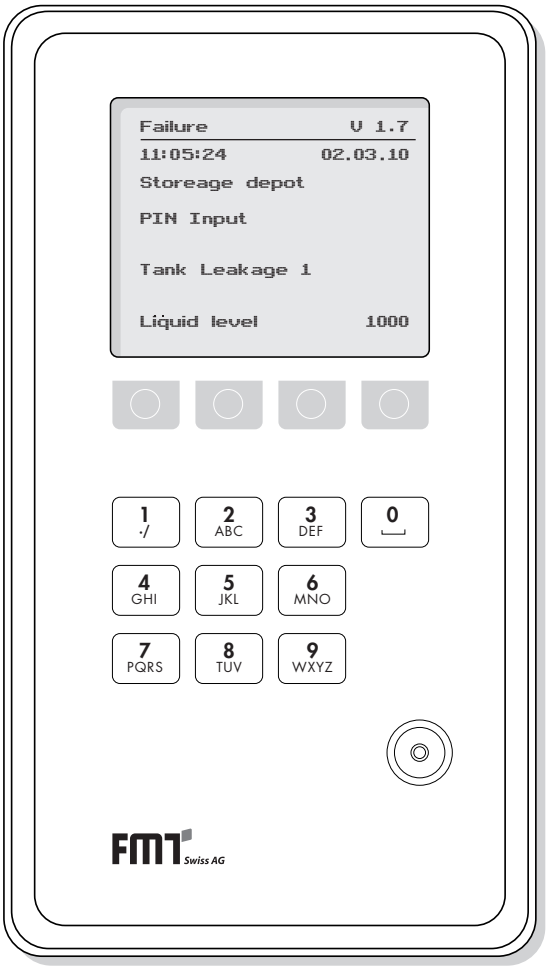



Check the complete display.
Go back to starting menu pressing the Return-button.

# Emergency function to empty a leaking tank



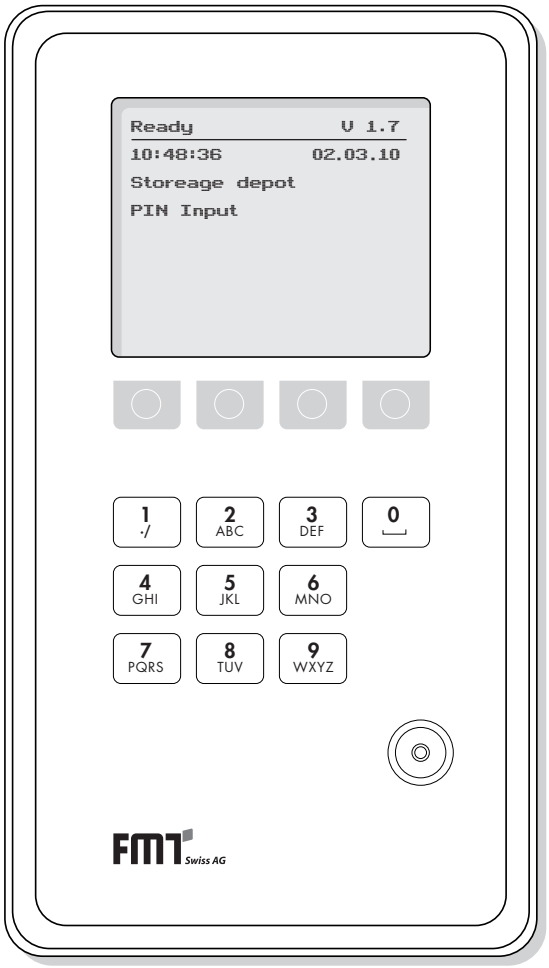

Back at start menu 1



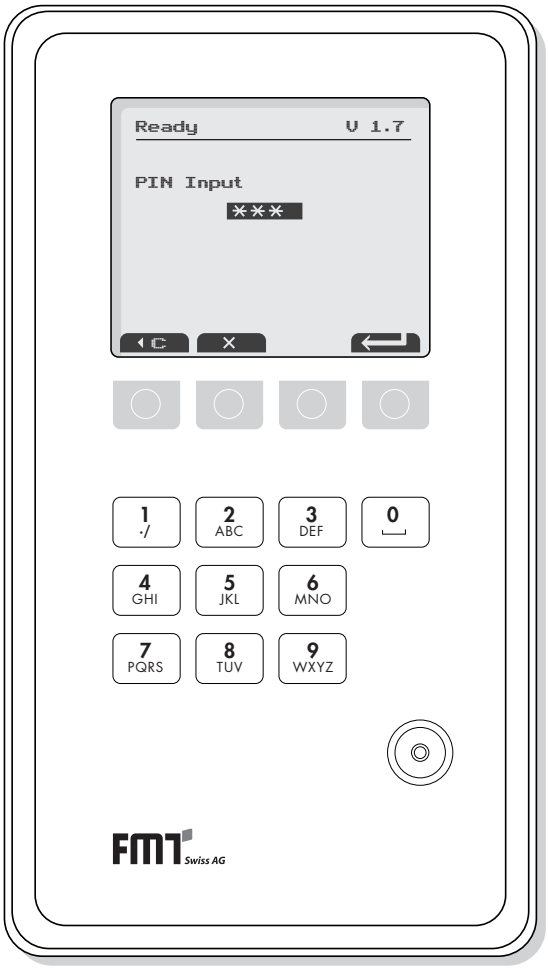

**The display shows „Tank leakage“**
(The complete tank installation is out of order.)

This situation occurs if a tank leaks. Noticing the leak the pre-set leakage sensor blocks the complete installation.
The leaking tank can be emptied by a manual switch on of the pump with the function“Check outputs“ in the Service menu.

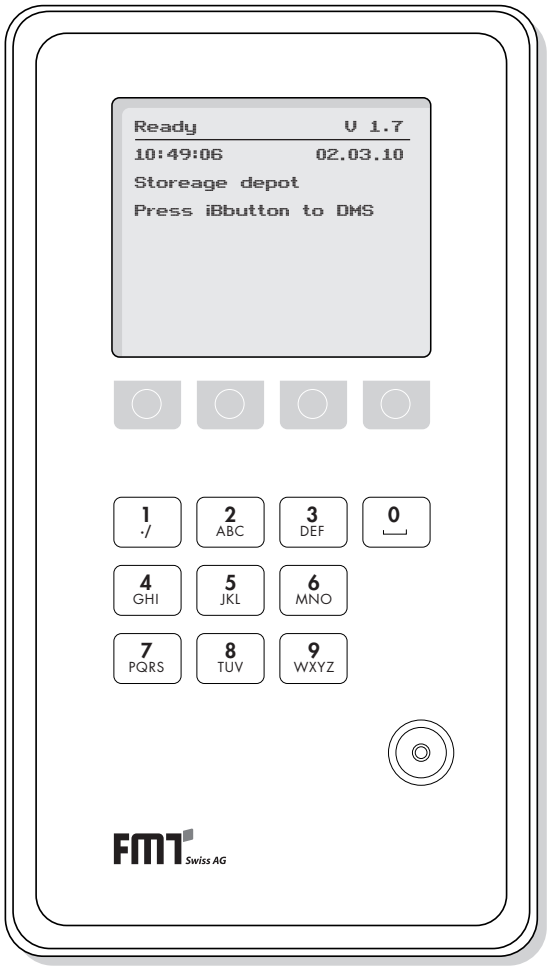
# 19. Operation of a refuelling process



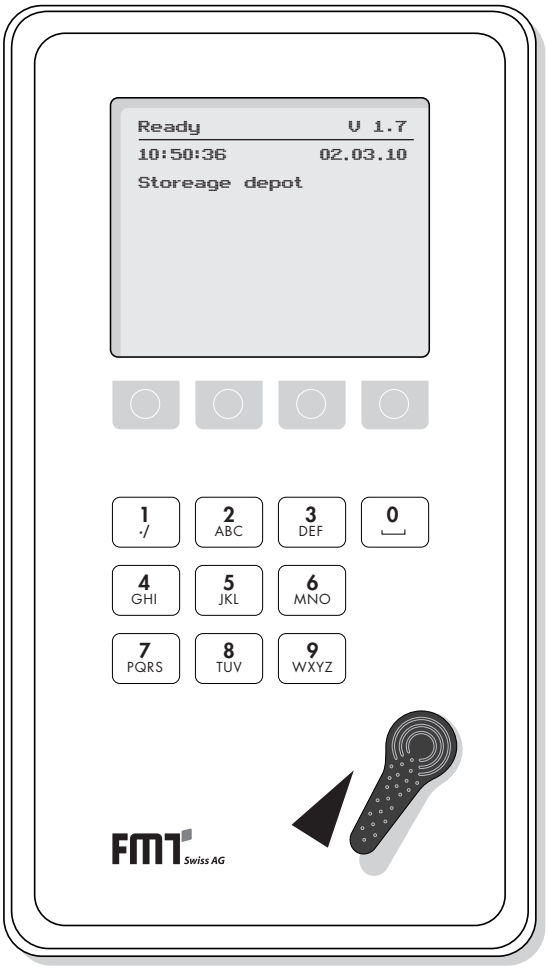

Request for PIN-input



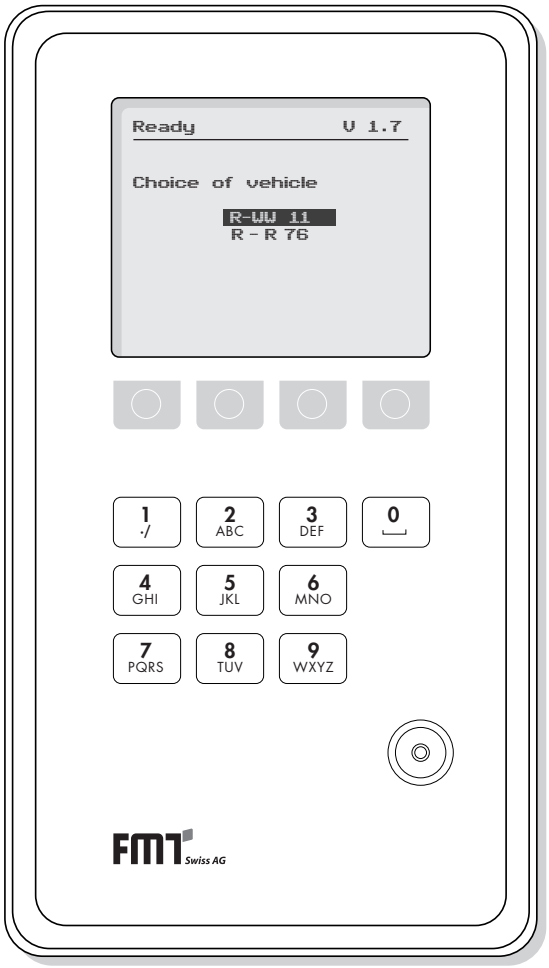

Enter 4-digits User PIN an press Return-button



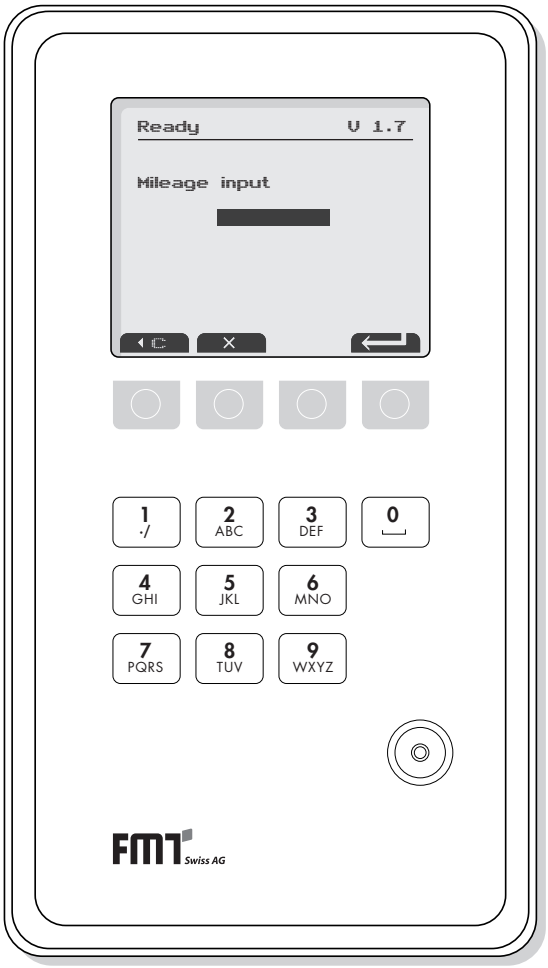

Request for iButton connection (in case i-button is pre-defined)



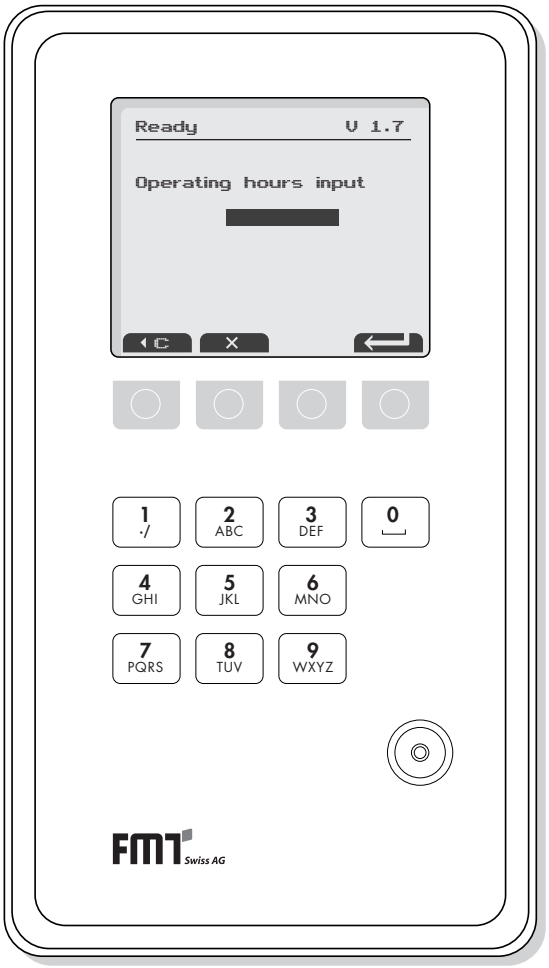

Connect black user iButton



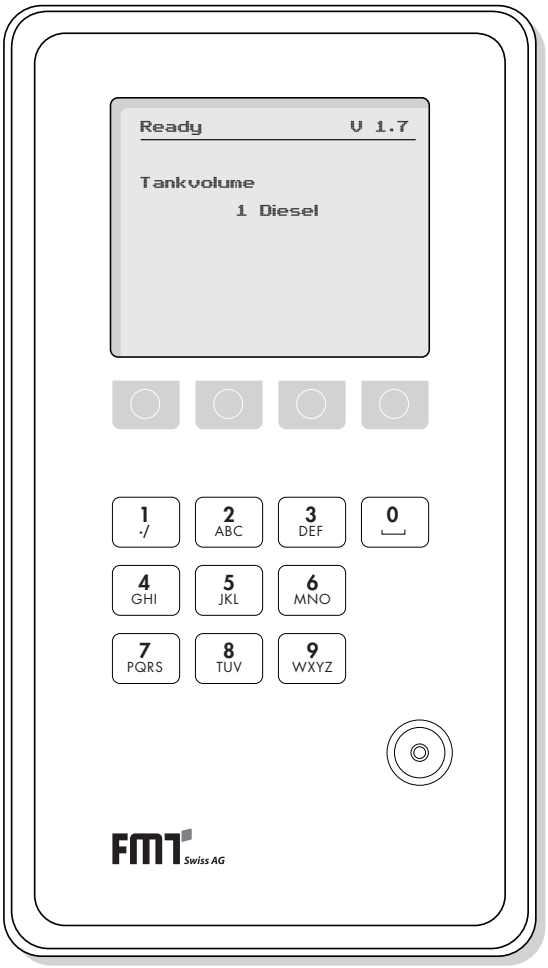

Select vehicle identification number (if not pre-defined).



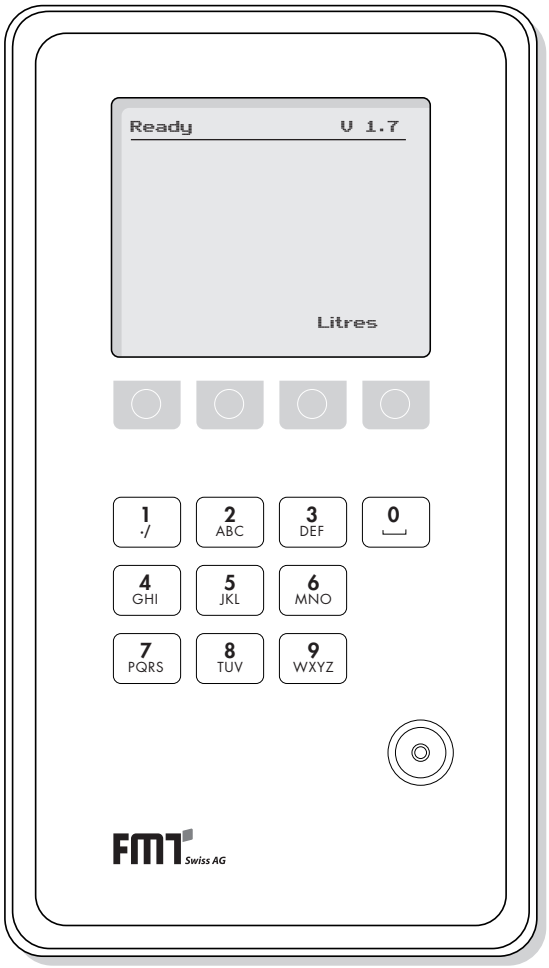

Enter mileage (if the input of the mileage is requested)



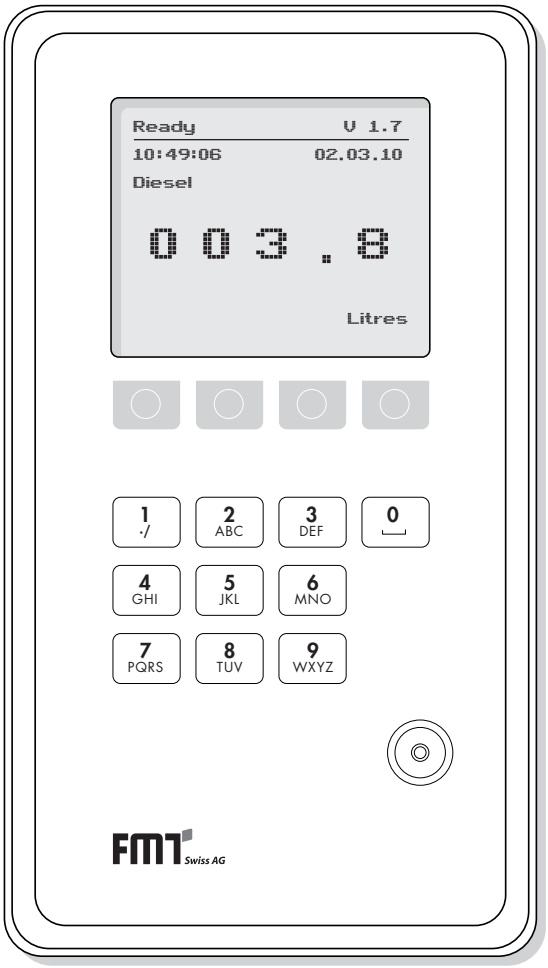

Enter operating hours (if the input of the operating hours is requested)



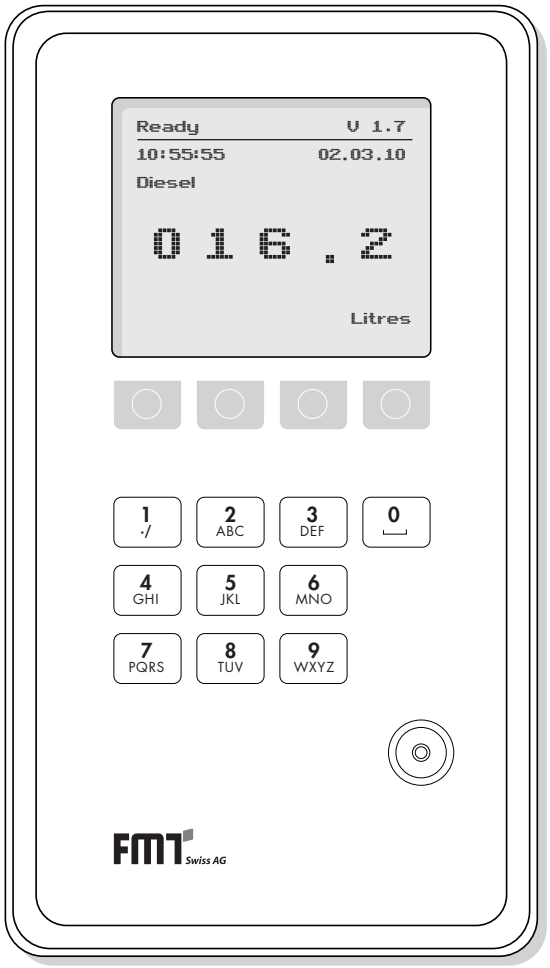

Tank level is displayed.



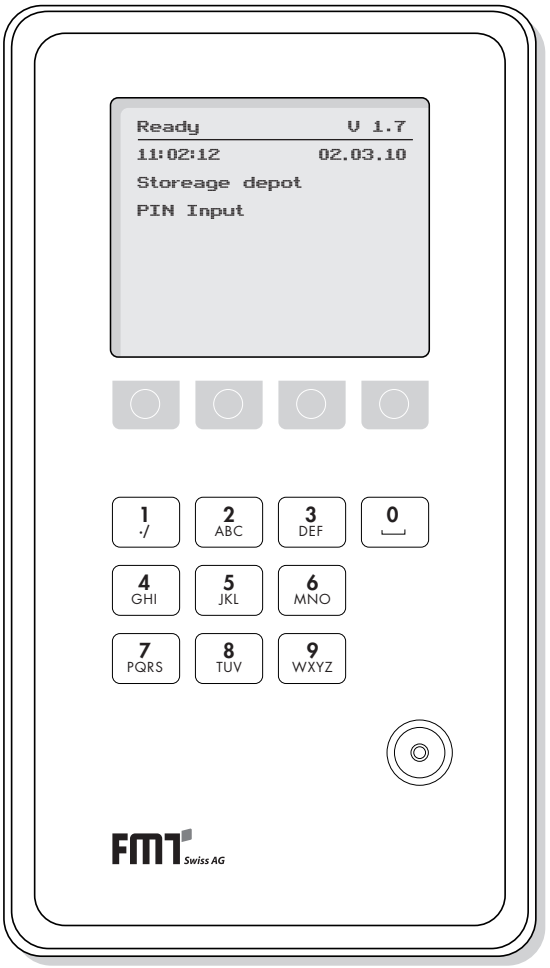

The display waits for the start of refuelling.




Refuelling in operation.




The total refuelled volume will be shown in litres after the refuelling process has been ended.



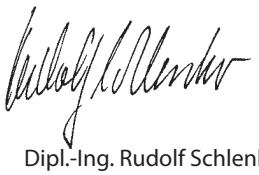

The display automatically sets back to starting menu according to the pre-set time of the system.

# 20. EC Declaration of Conformity

We hereby declare that the product described here, its concept and construction, including this particular model, complies with the EC requirements. Any change to the product, not approved by us, will invalidate the declaration.

| **Product Description** | **DieselManagementSystem** |
|---|---|
| Product Type | Control unit |
| Year of Manufacture | See Nameplate |
| Applicable EC-Directives | EC-Low Voltage Directives (73/23/EEC)<br>EC-Directives Electro-magnetic Compatibility<br>(89/336/EEC) - 93/31/EEC |
| Applicable National Standards | DIN VDE 0843 T1 (German) |

11.04.2011 FMT Swiss AG



Dipl.-Ing. Rudolf Schlenker

# 21. Data-flow DMS DieselManagementSystem

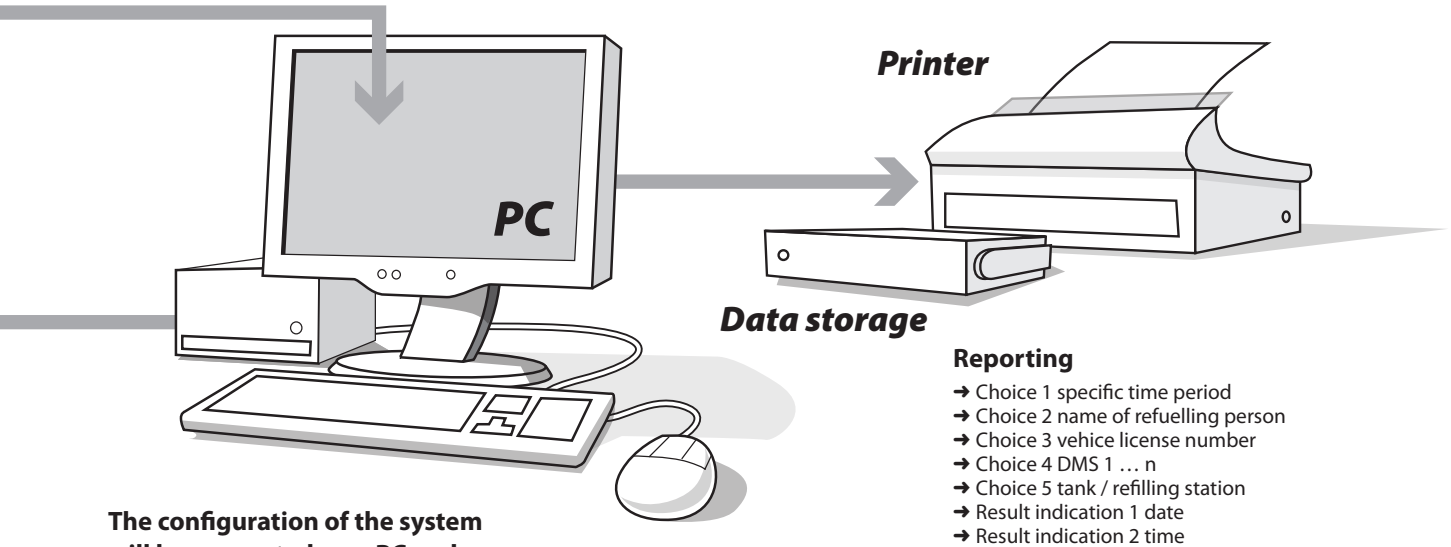
***DMS 1-n***

***SD-card***

**Import to PC adminstration software**

- ➜ DMS from SD-card
- ➜ DMS no. …
- ➜ Description of place
- ➜ Tank / refilling station no. …
- ➜ Date of refilling process
- ➜ Time of refilling process
- ➜ Name
- ➜ Litres
- ➜ Mileage
- ➜ Vehicle license number
- ➜ Operating hours

**The configuration of the system will be transmitted with the SD-card to the DMS.**



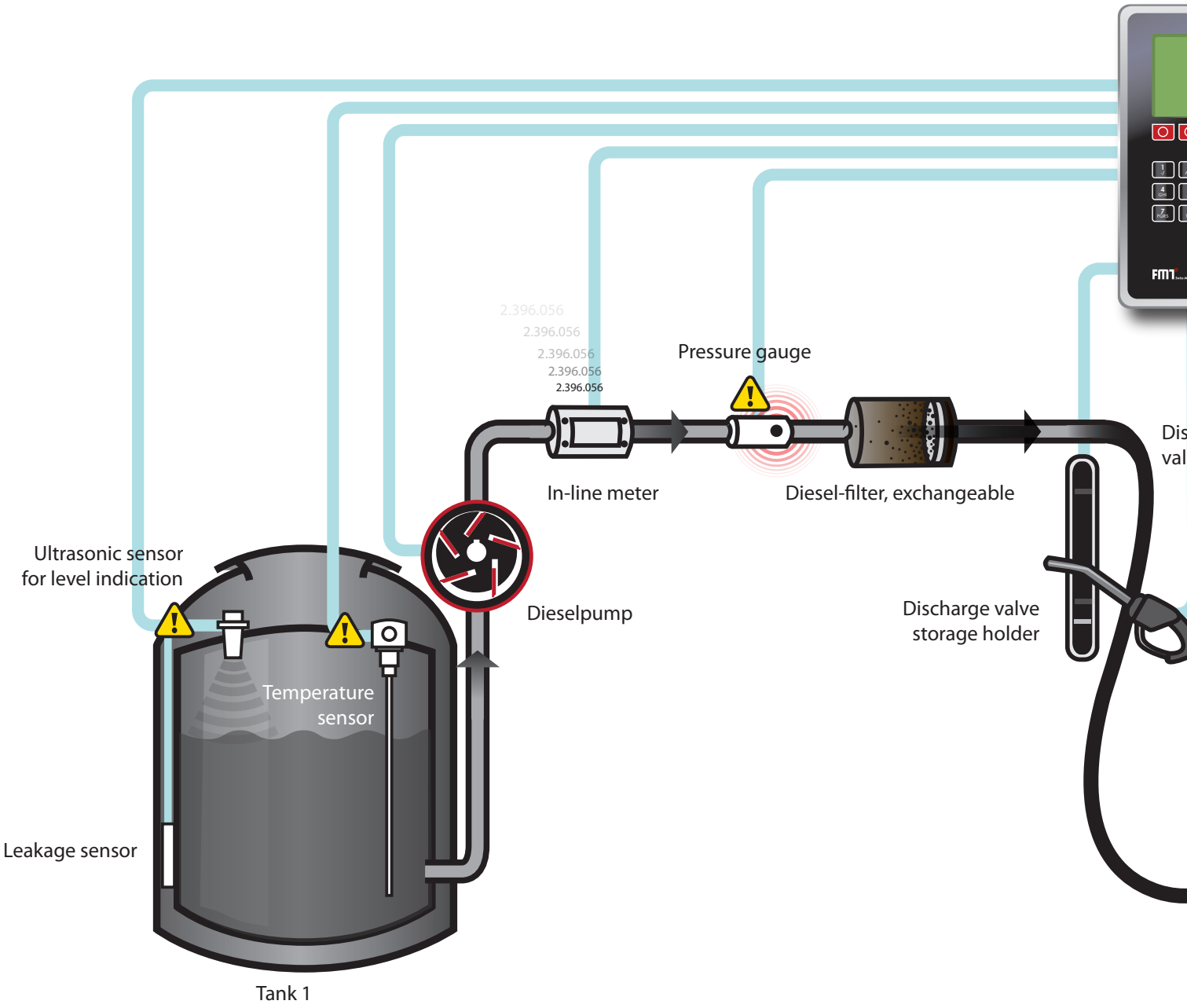

## The configuration of the system will be generated on a PC and stored on the SD-card

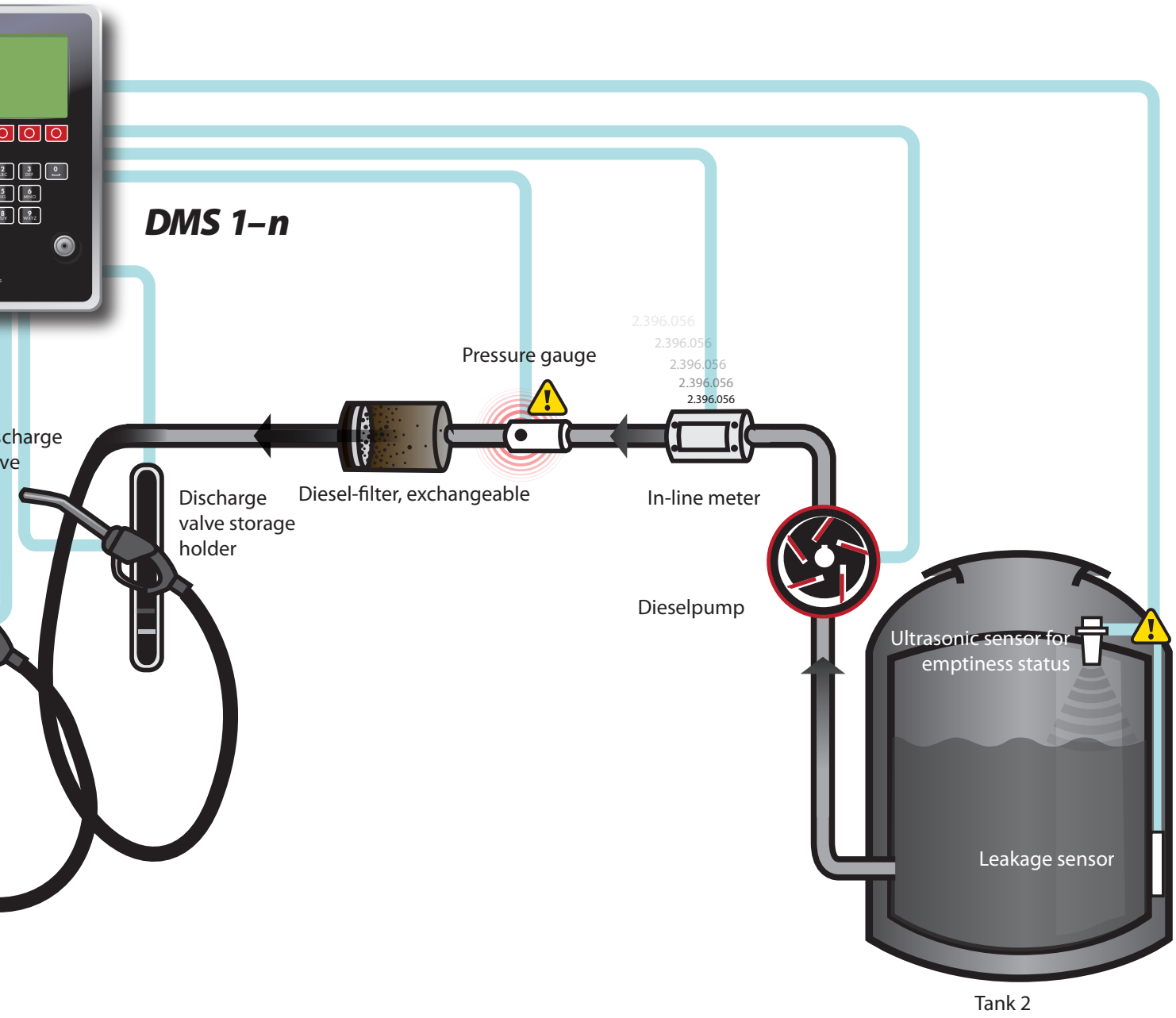
- ➜ Names of users
- ➜ Configuration of i-button ident
- ➜ Assignation of the i-button ident to a user
- ➜ Number of permitted input failures (PIN)
- ➜ Time-out after permitted input failiures (min)
- ➜ Time between refuelling and non-operative time (sec)
- ➜ Configuration of user pass-words
- ➜ Type of user, user oriented
- ➜ Classification of vehicles, user oriented
- ➜ Decription of vehicles
- ➜ Classification of refilling station = tank, user oriented
- ➜ Decription of refilling station = tank
- ➜ Minimum refilling level for empty tank 1 — metered
- ➜ Volume calibration = tank 1
- ➜ Volume adjustments
- ➜ Language
- ➜ Charakter set
- ➜ Mileage input yes/no, user oriented
- ➜ Input of operating hours yes/no user oriented
- ➜ Max. refuelling voulme, all users
- ➜ Pressure = refilling station 1: yes/no — optional
- ➜ Pressure = refilling station 1 = DMS 1: maximum pressure — optional
- ➜ Pressure = refilling station 1 = DMS 1: minimum pressure — optional
- ➜ Pressure = refilling station 1 = DMS 1: pressure threshold — optional
- ➜ Liquid level tank 1: yes/no = DMS 1
- ➜ Integral leakage sensor: yes/no = DMS 1 = tank 1 — optional
- ➜ Leakage: yes/no = DMS 1 = tank 1 — optional
- ➜ Pressure = refilling station 2 = DMS 1: pressure threshold — optional
- ➜ Tank empty = tank 2 = DMS 1 — optional
- ➜ Tank leakage = tank 2 = DMS 1 — optional
- ➜ Temperature of tank 1: yes/no = DMS 1 — optional
- ➜ Temperature of tank 1: min = DMS 1 — optional
- ➜ Temperature of tank 1: max = DMS 1 — optional
- ➜ Temperature of tank 1: threshold = DMS 1 — optional
- ➜ DMS heating switch-on at (°C)
- ➜ DMS heating switch-off at (°C)
- ➜ Background illumination (min)
- ➜ Time delay of pump operation (sec)
- ➜ Liquid-flow check time (sec)

## Reporting

- ➜ Choice 1 specific time period
- ➜ Choice 2 name of refuelling person
- ➜ Choice 3 vehice license number
- ➜ Choice 4 DMS 1 … n
- ➜ Choice 5 tank / refilling station
- ➜ Result indication 1 date
- ➜ Result indication 2 time
- ➜ Result indication 3 name
- ➜ Result indication 4 vehicle license number
- ➜ Result indication 5 volume discharged
- ➜ Result indication 6 refilling station/tank
- ➜ Result indication 7 mileage
- ➜ Result indication 8 consumption / 100 km
- ➜ Result indication 9 operating hours
- ➜ Result indication 10 consumption l/h
- ➜ Result indication 11 remarks
- ➜ Result indication 12 description

# 22. General survey DMS DieselManagementSystem




DMS 1–n
Pressure gauge
2.396.056
2.396.056
2.396.056
2.396.056
2.396.056
charge
ve
Discharge
valve storage
holder
Diesel-filter, exchangeable
In-line meter
Dieselpump
Ultrasonic sensor for
emptiness status
Leakage sensor
Tank 2

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